MEMO

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TO:	Michael Park, PE, PTOE, City of Lee's Summit
FROM:	Todd Fredericksen, PE, PTOE
	Tom Fulton, Technical Leader
RE:	Woodside Ridge TIS Turn Lane Review
DATE:	February 11, 2018
PROJECT #:	018-1140

This memorandum is a supplemental document to the *Woodside Ridge Traffic Impact Study* submitted July 2018 by Olsson. Based on guidance provided in the City of Lee's Summit Access Management Code and vehicular trips expected with the proposed development, a 200-foot plus taper southbound right-turn lane was recommended at the intersection of Pryor Road and O'Brien Road. After a review of the constructability of the recommended turn lane, it was determined that due to utility conflicts construction of the full length turn lane may not be fiscally reasonable. This memorandum summarizes expected operations with the recommended southbound turn lane (as presented in the July 2018 traffic impact study) and evaluates expected operations with a southbound turn lane of reduced length and with no southbound turn lane.

The July 2018 traffic impact study provides a summary of existing traffic volumes, expected trip generation with the proposed development, and expected traffic operations with the addition of proposed development traffic. As presented in the report, the southbound right-turn movement has an expected volume of 20 vehicles during the AM peak hour period and 68 vehicles during the PM peak hour period. The criteria for a right-turn lane along a major arterial roadway (Pryor Road) is 30 vehicles in any hour, per the City of Lee's Summit Access Management Code. The PM peak hour southbound right-turn volume is expected to meet this criteria for construction of a right-turn lane. With the addition of a 200-foot southbound right-turn lane at the intersection of Pryor Road and O'Brien road, the intersection is expected to operate at an overall LOS B during the AM and PM peak hour periods. The southbound right-turn movement is expected to operate at a LOS B with a 95th-percentile queue length of less than one vehicle during the AM and PM peak hour periods. The adjacent southbound through lanes are expected to operate at a LOS B with a 95th-percentile queue length of 82 feet

and 268 feet during the AM and PM peak hour periods, respectively. The 95th-percentile PM peak hour southbound through movement queue may block access to the southbound right-turn lane during portions of the peak hour period.

Two alternatives were evaluated for the southbound movement at the intersection of Pryor Road and O'Brien Road to account for the utility conflicts identified during the design process. The first alternative considers reducing the length of the recommended southbound right-turn lane to 80 feet plus taper. With a reduced southbound right-turn lane length, the intersection is expected to continue operating at an overall LOS B during the AM and PM peak hour periods. The southbound right-turn lane and through lane movements are expected to operate at a LOS B with the same 95th-percentile queue lengths as expected with a 200-foot turn lane. With an 80-foot turn lane, the 95th-percentile AM and PM peak hour southbound through movement queue may block access to the southbound right-turn lane during portions of the peak hour period.

The second alternative evaluated a shared southbound through/right-turn movement (no construction of a separate right-turn lane). With a shared southbound through/right-turn movement, the intersection is expected to continue operating at an overall LOS B during the AM and PM peak hour periods. The shared southbound through/right-turn movement is expected to operate at a LOS B during the AM and PM peak hour periods, similar to conditions with a separate right-turn lane. During the AM peak hour period, the 95th-percentile queue length is expected to be 89 feet. During the PM peak hour period, the 95th-percentile queue length is expected to be 311 feet.

Table 1 provides a comparison of operations considering a 200 foot turn lane and the two alternatives evaluated for the southbound right-turn movement at Pryor Road and O'Brien Road. Analysis files are provided in the **Appendix**.

Table 1. Southbound Movement Operational Comparison.

Southbound Movement Treatment	AM Peak Hour Period Operations			PM Peak Hour Period Operations		
	Overall Intersection*	Southbound Through**	Southbound Right**	Overall Intersection*	Southbound Through**	Southbound Right**
200-foot southbound right turn lane	B	B (82')	B (<25')	B	B (268')	B (<25')
80-foot southbound right turn lane	B	B (82')	B (<25')	B	B (268')	B (<25')
No dedicated right turn lane	B	B (89')	-	B	B (311')	-

*LOS
**LOS (95th-Percentile Queue)

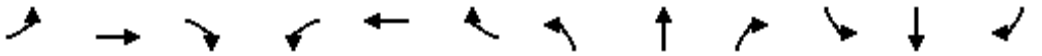
As summarized in **Table 1**, there is no operational difference noted whether a 200-foot or 80-foot southbound right-turn lane is provided at the intersection of Pryor Road and O'Brien Road. A shorter (80-foot) southbound right-turn lane may be blocked for a longer duration of the peak hour period when compared to a 200-foot turn lane. With a reduced (80 foot) right-turn lane, more vehicular deceleration will occur in the adjacent thru lane due to the reduced length of the turn lane. If a southbound right-turn lane is not provided, the southbound through movement 95th-percentile queue length is expected to increase by 7 feet during the AM peak hour period and 43 feet during the PM peak hour period. For all alternatives, overall traffic operations are expected to be acceptable.

We hope that we have provided adequate information for your request. If you have additional questions, please contact us at 913.381.1170.

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	77	69	16	104	9	733	114	332	40
v/c Ratio	0.22	0.15	0.06	0.37	0.02	0.45	0.27	0.15	0.04
Control Delay	20.4	12.5	19.6	12.7	9.1	19.5	10.5	10.9	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	20.4	12.5	19.6	12.7	9.1	19.5	10.5	10.9	0.1
Queue Length 50th (ft)	22	6	4	2	2	129	22	34	0
Queue Length 95th (ft)	52	0	15	0	9	188	36	82	0
Internal Link Dist (ft)		181		218		1102		997	
Turn Bay Length (ft)	150		185		200		200		80
Base Capacity (vph)	514	890	511	879	746	1882	577	2097	971
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.15	0.08	0.03	0.12	0.01	0.39	0.20	0.16	0.04

Intersection Summary

80-foot turn lane

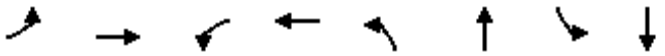


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	60	6	27	11	1	55	9	529	53	73	279	20
Future Volume (veh/h)	60	6	27	11	1	55	9	529	53	73	279	20
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1767	1870	1870	1870	1945	1870	1870	1945	1870
Adj Flow Rate, veh/h	77	20	49	16	4	100	9	653	80	114	332	40
Peak Hour Factor	0.78	0.30	0.55	0.69	0.25	0.55	1.00	0.81	0.66	0.64	0.84	0.50
Percent Heavy Veh, %	2	2	2	9	2	2	2	2	2	2	2	2
Cap, veh/h	344	50	122	378	9	219	439	942	115	362	1324	568
Arrive On Green	0.06	0.10	0.10	0.10	0.14	0.14	0.01	0.28	0.28	0.09	0.36	0.36
Sat Flow, veh/h	1781	481	1178	1682	61	1533	1781	3315	406	1781	3696	1585
Grp Volume(v), veh/h	77	0	69	16	0	104	9	364	369	114	332	40
Grp Sat Flow(s),veh/h/ln	1781	0	1658	1682	0	1594	1781	1848	1872	1781	1848	1585
Q Serve(g_s), s	2.1	0.0	2.2	0.4	0.0	3.4	0.2	10.0	10.0	2.4	3.6	0.9
Cycle Q Clear(g_c), s	2.1	0.0	2.2	0.4	0.0	3.4	0.2	10.0	10.0	2.4	3.6	0.9
Prop In Lane	1.00		0.71	1.00		0.96	1.00		0.22	1.00		1.00
Lane Grp Cap(c), veh/h	344	0	172	378	0	228	439	525	532	362	1324	568
V/C Ratio(X)	0.22	0.00	0.40	0.04	0.00	0.46	0.02	0.69	0.69	0.31	0.25	0.07
Avail Cap(c_a), veh/h	673	0	848	624	0	815	853	945	957	645	1889	810
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	20.7	0.0	23.8	18.2	0.0	22.3	14.0	18.1	18.1	12.9	12.8	12.0
Incr Delay (d2), s/veh	0.3	0.0	1.5	0.0	0.0	1.4	0.0	1.7	1.6	0.5	0.1	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.9	0.0	0.9	0.2	0.0	1.3	0.1	3.9	4.0	0.9	1.3	0.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	21.0	0.0	25.3	18.2	0.0	23.7	14.1	19.8	19.8	13.4	12.9	12.0
LnGrp LOS	C	A	C	B	A	C	B	B	B	B	B	B
Approach Vol, veh/h		146			120			742			486	
Approach Delay, s/veh		23.0			23.0			19.7			13.0	
Approach LOS		C			C			B			B	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	11.0	22.1	9.5	14.1	6.8	26.3	11.7	11.9
Change Period (Y+Rc), s	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Max Green Setting (Gmax), s	14.0	29.0	14.0	29.0	14.0	29.0	14.0	29.0
Max Q Clear Time (g_c+I1), s	4.4	12.0	4.1	5.4	2.2	5.6	2.4	4.2
Green Ext Time (p_c), s	0.2	4.1	0.1	0.6	0.0	2.2	0.0	0.3

Intersection Summary	
HCM 6th Ctrl Delay	18.1
HCM 6th LOS	B

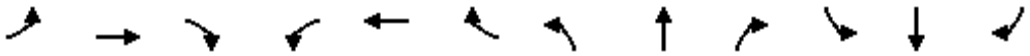
80-foot turn lane



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	77	69	16	104	9	733	114	372
v/c Ratio	0.22	0.15	0.06	0.37	0.02	0.45	0.27	0.18
Control Delay	20.4	12.5	19.6	12.7	9.1	19.5	10.5	10.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	20.4	12.5	19.6	12.7	9.1	19.5	10.5	10.7
Queue Length 50th (ft)	22	6	4	2	2	129	22	37
Queue Length 95th (ft)	52	0	15	0	9	188	36	89
Internal Link Dist (ft)		181		218		1102		997
Turn Bay Length (ft)	150		185		200		200	
Base Capacity (vph)	514	890	511	879	734	1882	577	2068
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.15	0.08	0.03	0.12	0.01	0.39	0.20	0.18

Intersection Summary

no dedicated turn lane



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	60	6	27	11	1	55	9	529	53	73	279	20
Future Volume (veh/h)	60	6	27	11	1	55	9	529	53	73	279	20
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1767	1870	1870	1870	1945	1870	1870	1945	1870
Adj Flow Rate, veh/h	77	20	49	16	4	100	9	653	80	114	332	40
Peak Hour Factor	0.78	0.30	0.55	0.69	0.25	0.55	1.00	0.81	0.66	0.64	0.84	0.50
Percent Heavy Veh, %	2	2	2	9	2	2	2	2	2	2	2	2
Cap, veh/h	344	50	122	378	9	219	439	942	115	362	1191	142
Arrive On Green	0.06	0.10	0.10	0.10	0.14	0.14	0.01	0.28	0.28	0.09	0.36	0.36
Sat Flow, veh/h	1781	481	1178	1682	61	1533	1781	3315	406	1781	3324	397
Grp Volume(v), veh/h	77	0	69	16	0	104	9	364	369	114	183	189
Grp Sat Flow(s),veh/h/ln	1781	0	1658	1682	0	1594	1781	1848	1872	1781	1848	1874
Q Serve(g_s), s	2.1	0.0	2.2	0.4	0.0	3.4	0.2	10.0	10.0	2.4	4.0	4.1
Cycle Q Clear(g_c), s	2.1	0.0	2.2	0.4	0.0	3.4	0.2	10.0	10.0	2.4	4.0	4.1
Prop In Lane	1.00		0.71	1.00		0.96	1.00		0.22	1.00		0.21
Lane Grp Cap(c), veh/h	344	0	172	378	0	228	439	525	532	362	662	671
V/C Ratio(X)	0.22	0.00	0.40	0.04	0.00	0.46	0.02	0.69	0.69	0.31	0.28	0.28
Avail Cap(c_a), veh/h	673	0	848	624	0	815	853	945	957	645	945	958
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	20.7	0.0	23.8	18.2	0.0	22.3	14.0	18.1	18.1	12.9	13.0	13.0
Incr Delay (d2), s/veh	0.3	0.0	1.5	0.0	0.0	1.4	0.0	1.7	1.6	0.5	0.2	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.9	0.0	0.9	0.2	0.0	1.3	0.1	3.9	4.0	0.9	1.5	1.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	21.0	0.0	25.3	18.2	0.0	23.7	14.1	19.8	19.8	13.4	13.2	13.2
LnGrp LOS	C	A	C	B	A	C	B	B	B	B	B	B
Approach Vol, veh/h		146			120			742			486	
Approach Delay, s/veh		23.0			23.0			19.7			13.2	
Approach LOS		C			C			B			B	

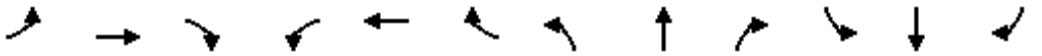
Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	11.0	22.1	9.5	14.1	6.8	26.3	11.7	11.9
Change Period (Y+Rc), s	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Max Green Setting (Gmax), s	14.0	29.0	14.0	29.0	14.0	29.0	14.0	29.0
Max Q Clear Time (g_c+I1), s	4.4	12.0	4.1	5.4	2.2	6.1	2.4	4.2
Green Ext Time (p_c), s	0.2	4.1	0.1	0.6	0.0	2.1	0.0	0.3

Intersection Summary	
HCM 6th Ctrl Delay	18.2
HCM 6th LOS	B

no dedicated turn lane

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	77	69	16	104	9	733	114	332	40
v/c Ratio	0.22	0.15	0.06	0.37	0.02	0.45	0.27	0.15	0.04
Control Delay	20.4	12.5	19.6	12.7	9.1	19.5	10.5	10.9	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	20.4	12.5	19.6	12.7	9.1	19.5	10.5	10.9	0.1
Queue Length 50th (ft)	22	6	4	2	2	129	22	34	0
Queue Length 95th (ft)	52	0	15	0	9	188	36	82	0
Internal Link Dist (ft)		181		218		1102		997	
Turn Bay Length (ft)	150		185		200		200		200
Base Capacity (vph)	514	890	511	879	746	1882	577	2097	971
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.15	0.08	0.03	0.12	0.01	0.39	0.20	0.16	0.04

Intersection Summary



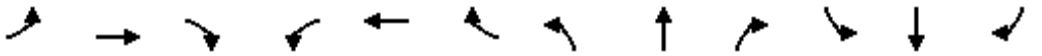
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	60	6	27	11	1	55	9	529	53	73	279	20
Future Volume (veh/h)	60	6	27	11	1	55	9	529	53	73	279	20
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1767	1870	1870	1870	1945	1870	1870	1945	1870
Adj Flow Rate, veh/h	77	20	49	16	4	100	9	653	80	114	332	40
Peak Hour Factor	0.78	0.30	0.55	0.69	0.25	0.55	1.00	0.81	0.66	0.64	0.84	0.50
Percent Heavy Veh, %	2	2	2	9	2	2	2	2	2	2	2	2
Cap, veh/h	344	50	122	378	9	219	439	942	115	362	1324	568
Arrive On Green	0.06	0.10	0.10	0.10	0.14	0.14	0.01	0.28	0.28	0.09	0.36	0.36
Sat Flow, veh/h	1781	481	1178	1682	61	1533	1781	3315	406	1781	3696	1585
Grp Volume(v), veh/h	77	0	69	16	0	104	9	364	369	114	332	40
Grp Sat Flow(s),veh/h/ln	1781	0	1658	1682	0	1594	1781	1848	1872	1781	1848	1585
Q Serve(g_s), s	2.1	0.0	2.2	0.4	0.0	3.4	0.2	10.0	10.0	2.4	3.6	0.9
Cycle Q Clear(g_c), s	2.1	0.0	2.2	0.4	0.0	3.4	0.2	10.0	10.0	2.4	3.6	0.9
Prop In Lane	1.00		0.71	1.00		0.96	1.00		0.22	1.00		1.00
Lane Grp Cap(c), veh/h	344	0	172	378	0	228	439	525	532	362	1324	568
V/C Ratio(X)	0.22	0.00	0.40	0.04	0.00	0.46	0.02	0.69	0.69	0.31	0.25	0.07
Avail Cap(c_a), veh/h	673	0	848	624	0	815	853	945	957	645	1889	810
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	20.7	0.0	23.8	18.2	0.0	22.3	14.0	18.1	18.1	12.9	12.8	12.0
Incr Delay (d2), s/veh	0.3	0.0	1.5	0.0	0.0	1.4	0.0	1.7	1.6	0.5	0.1	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.9	0.0	0.9	0.2	0.0	1.3	0.1	3.9	4.0	0.9	1.3	0.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	21.0	0.0	25.3	18.2	0.0	23.7	14.1	19.8	19.8	13.4	12.9	12.0
LnGrp LOS	C	A	C	B	A	C	B	B	B	B	B	B
Approach Vol, veh/h		146			120			742			486	
Approach Delay, s/veh		23.0			23.0			19.7			13.0	
Approach LOS		C			C			B			B	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	11.0	22.1	9.5	14.1	6.8	26.3	11.7	11.9
Change Period (Y+Rc), s	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Max Green Setting (Gmax), s	14.0	29.0	14.0	29.0	14.0	29.0	14.0	29.0
Max Q Clear Time (g_c+I1), s	4.4	12.0	4.1	5.4	2.2	5.6	2.4	4.2
Green Ext Time (p_c), s	0.2	4.1	0.1	0.6	0.0	2.2	0.0	0.3

Intersection Summary	
HCM 6th Ctrl Delay	18.1
HCM 6th LOS	B

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	70	57	47	88	56	770	125	868	113
v/c Ratio	0.35	0.20	0.15	0.18	0.14	0.45	0.29	0.44	0.12
Control Delay	36.2	15.4	20.4	8.8	10.6	20.1	11.3	17.8	2.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	36.2	15.4	20.4	8.8	10.6	20.1	11.3	17.8	2.1
Queue Length 50th (ft)	31	5	15	6	12	153	27	174	0
Queue Length 95th (ft)	52	0	33	0	20	237	40	268	0
Internal Link Dist (ft)		181		218		1102		997	
Turn Bay Length (ft)	150		185		200		200		80
Base Capacity (vph)	667	862	500	1239	592	1854	582	1930	906
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.10	0.07	0.09	0.07	0.09	0.42	0.21	0.45	0.12

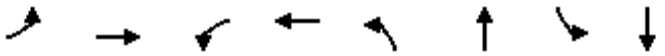
Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	44	3	18	34	6	48	31	613	43	75	764	68
Future Volume (veh/h)	44	3	18	34	6	48	31	613	43	75	764	68
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1856	1870	1870	1870	1945	1870	1856	1945	1870
Adj Flow Rate, veh/h	70	12	45	47	20	68	56	713	57	125	868	113
Peak Hour Factor	0.63	0.25	0.40	0.73	0.30	0.71	0.55	0.86	0.75	0.60	0.88	0.60
Percent Heavy Veh, %	2	2	2	3	2	2	2	2	2	3	2	2
Cap, veh/h	255	34	129	376	110	374	308	1062	85	370	1236	530
Arrive On Green	0.10	0.10	0.10	0.09	0.29	0.29	0.06	0.31	0.31	0.09	0.33	0.33
Sat Flow, veh/h	1309	345	1293	1767	373	1269	1781	3466	277	1767	3696	1585
Grp Volume(v), veh/h	70	0	57	47	0	88	56	380	390	125	868	113
Grp Sat Flow(s),veh/h/ln	1309	0	1638	1767	0	1642	1781	1848	1895	1767	1848	1585
Q Serve(g_s), s	3.0	0.0	1.9	1.2	0.0	2.3	1.2	10.4	10.5	2.7	11.9	3.0
Cycle Q Clear(g_c), s	3.0	0.0	1.9	1.2	0.0	2.3	1.2	10.4	10.5	2.7	11.9	3.0
Prop In Lane	1.00		0.79	1.00		0.77	1.00		0.15	1.00		1.00
Lane Grp Cap(c), veh/h	255	0	164	376	0	484	308	566	581	370	1236	530
V/C Ratio(X)	0.27	0.00	0.35	0.13	0.00	0.18	0.18	0.67	0.67	0.34	0.70	0.21
Avail Cap(c_a), veh/h	776	0	816	639	0	1383	627	921	945	637	1843	790
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	24.9	0.0	24.4	18.0	0.0	15.3	13.0	17.6	17.6	12.6	16.8	13.9
Incr Delay (d2), s/veh	0.6	0.0	1.3	0.1	0.0	0.2	0.3	1.4	1.4	0.5	0.7	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.9	0.0	0.8	0.5	0.0	0.8	0.4	4.1	4.2	0.9	4.5	1.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	25.5	0.0	25.7	18.2	0.0	15.5	13.3	19.0	19.0	13.1	17.6	14.1
LnGrp LOS	C	A	C	B	A	B	B	B	B	B	B	B
Approach Vol, veh/h		127			135			826			1106	
Approach Delay, s/veh		25.6			16.4			18.6			16.7	
Approach LOS		C			B			B			B	

Timer - Assigned Phs	1	2		4	5	6	7	8				
Phs Duration (G+Y+Rc), s	11.2	23.8		23.1	9.6	25.5	11.3	11.8				
Change Period (Y+Rc), s	6.0	6.0		6.0	6.0	6.0	6.0	6.0				
Max Green Setting (Gmax), s	14.0	29.0		49.0	14.0	29.0	14.0	29.0				
Max Q Clear Time (g_c+I1), s	4.7	12.5		4.3	3.2	13.9	3.2	5.0				
Green Ext Time (p_c), s	0.2	4.3		0.6	0.1	5.6	0.1	0.5				

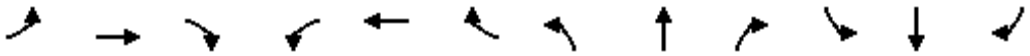
Intersection Summary												
HCM 6th Ctrl Delay			17.9									
HCM 6th LOS			B									



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	70	57	47	88	56	770	125	981
v/c Ratio	0.37	0.21	0.15	0.19	0.16	0.45	0.29	0.50
Control Delay	37.5	15.7	20.8	8.9	10.8	19.9	11.3	18.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	37.5	15.7	20.8	8.9	10.8	19.9	11.3	18.4
Queue Length 50th (ft)	32	5	16	7	12	153	27	204
Queue Length 95th (ft)	52	0	33	0	20	237	40	311
Internal Link Dist (ft)		181		218		1102		997
Turn Bay Length (ft)	150		185		200		200	
Base Capacity (vph)	597	777	455	1233	533	1904	559	1952
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.12	0.07	0.10	0.07	0.11	0.40	0.22	0.50

Intersection Summary

no dedicated turn lane



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	44	3	18	34	6	48	31	613	43	75	764	68
Future Volume (veh/h)	44	3	18	34	6	48	31	613	43	75	764	68
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1856	1870	1870	1870	1945	1870	1856	1945	1870
Adj Flow Rate, veh/h	70	12	45	47	20	68	56	713	57	125	868	113
Peak Hour Factor	0.63	0.25	0.40	0.73	0.30	0.71	0.55	0.86	0.75	0.60	0.88	0.60
Percent Heavy Veh, %	2	2	2	3	2	2	2	2	2	3	2	2
Cap, veh/h	248	34	126	365	107	364	297	1125	90	379	1156	150
Arrive On Green	0.10	0.10	0.10	0.09	0.29	0.29	0.06	0.32	0.32	0.09	0.35	0.35
Sat Flow, veh/h	1309	345	1293	1767	373	1269	1781	3466	277	1767	3288	428
Grp Volume(v), veh/h	70	0	57	47	0	88	56	380	390	125	488	493
Grp Sat Flow(s),veh/h/ln	1309	0	1638	1767	0	1642	1781	1848	1895	1767	1848	1868
Q Serve(g_s), s	3.1	0.0	1.9	1.3	0.0	2.4	1.2	10.5	10.5	2.7	13.9	13.9
Cycle Q Clear(g_c), s	3.1	0.0	1.9	1.3	0.0	2.4	1.2	10.5	10.5	2.7	13.9	13.9
Prop In Lane	1.00		0.79	1.00		0.77	1.00		0.15	1.00		0.23
Lane Grp Cap(c), veh/h	248	0	160	365	0	472	297	600	615	379	649	657
V/C Ratio(X)	0.28	0.00	0.36	0.13	0.00	0.19	0.19	0.63	0.63	0.33	0.75	0.75
Avail Cap(c_a), veh/h	754	0	793	620	0	1344	605	895	918	637	895	905
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	25.8	0.0	25.3	18.8	0.0	16.1	13.1	17.2	17.2	12.3	17.1	17.1
Incr Delay (d2), s/veh	0.6	0.0	1.3	0.2	0.0	0.2	0.3	1.1	1.1	0.5	2.3	2.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.0	0.0	0.8	0.5	0.0	0.9	0.4	4.1	4.2	0.9	5.5	5.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	26.4	0.0	26.6	19.0	0.0	16.3	13.4	18.3	18.3	12.8	19.5	19.4
LnGrp LOS	C	A	C	B	A	B	B	B	B	B	B	B
Approach Vol, veh/h		127			135			826			1106	
Approach Delay, s/veh		26.5			17.2			18.0			18.7	
Approach LOS		C			B			B			B	

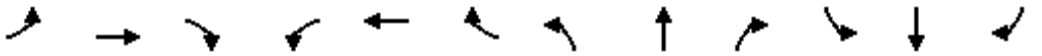
Timer - Assigned Phs	1	2		4	5	6	7	8				
Phs Duration (G+Y+Rc), s	11.2	25.4		23.2	9.6	27.0	11.4	11.8				
Change Period (Y+Rc), s	6.0	6.0		6.0	6.0	6.0	6.0	6.0				
Max Green Setting (Gmax), s	14.0	29.0		49.0	14.0	29.0	14.0	29.0				
Max Q Clear Time (g_c+I1), s	4.7	12.5		4.4	3.2	15.9	3.3	5.1				
Green Ext Time (p_c), s	0.2	4.3		0.6	0.1	5.1	0.1	0.5				

Intersection Summary												
HCM 6th Ctrl Delay			18.8									
HCM 6th LOS			B									

no dedicated turn lane

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	70	57	47	88	56	770	125	868	113
v/c Ratio	0.35	0.20	0.15	0.18	0.14	0.45	0.29	0.44	0.12
Control Delay	36.2	15.4	20.4	8.8	10.6	20.1	11.3	17.8	2.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	36.2	15.4	20.4	8.8	10.6	20.1	11.3	17.8	2.1
Queue Length 50th (ft)	31	5	15	6	12	153	27	174	0
Queue Length 95th (ft)	52	0	33	0	20	237	40	268	0
Internal Link Dist (ft)		181		218		1102		997	
Turn Bay Length (ft)	150		185		200		200		200
Base Capacity (vph)	667	862	500	1239	592	1854	582	1930	906
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.10	0.07	0.09	0.07	0.09	0.42	0.21	0.45	0.12

Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	44	3	18	34	6	48	31	613	43	75	764	68
Future Volume (veh/h)	44	3	18	34	6	48	31	613	43	75	764	68
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1856	1870	1870	1870	1945	1870	1856	1945	1870
Adj Flow Rate, veh/h	70	12	45	47	20	68	56	713	57	125	868	113
Peak Hour Factor	0.63	0.25	0.40	0.73	0.30	0.71	0.55	0.86	0.75	0.60	0.88	0.60
Percent Heavy Veh, %	2	2	2	3	2	2	2	2	2	3	2	2
Cap, veh/h	255	34	129	376	110	374	308	1062	85	370	1236	530
Arrive On Green	0.10	0.10	0.10	0.09	0.29	0.29	0.06	0.31	0.31	0.09	0.33	0.33
Sat Flow, veh/h	1309	345	1293	1767	373	1269	1781	3466	277	1767	3696	1585
Grp Volume(v), veh/h	70	0	57	47	0	88	56	380	390	125	868	113
Grp Sat Flow(s),veh/h/ln	1309	0	1638	1767	0	1642	1781	1848	1895	1767	1848	1585
Q Serve(g_s), s	3.0	0.0	1.9	1.2	0.0	2.3	1.2	10.4	10.5	2.7	11.9	3.0
Cycle Q Clear(g_c), s	3.0	0.0	1.9	1.2	0.0	2.3	1.2	10.4	10.5	2.7	11.9	3.0
Prop In Lane	1.00		0.79	1.00		0.77	1.00		0.15	1.00		1.00
Lane Grp Cap(c), veh/h	255	0	164	376	0	484	308	566	581	370	1236	530
V/C Ratio(X)	0.27	0.00	0.35	0.13	0.00	0.18	0.18	0.67	0.67	0.34	0.70	0.21
Avail Cap(c_a), veh/h	776	0	816	639	0	1383	627	921	945	637	1843	790
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	24.9	0.0	24.4	18.0	0.0	15.3	13.0	17.6	17.6	12.6	16.8	13.9
Incr Delay (d2), s/veh	0.6	0.0	1.3	0.1	0.0	0.2	0.3	1.4	1.4	0.5	0.7	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.9	0.0	0.8	0.5	0.0	0.8	0.4	4.1	4.2	0.9	4.5	1.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	25.5	0.0	25.7	18.2	0.0	15.5	13.3	19.0	19.0	13.1	17.6	14.1
LnGrp LOS	C	A	C	B	A	B	B	B	B	B	B	B
Approach Vol, veh/h		127			135			826			1106	
Approach Delay, s/veh		25.6			16.4			18.6			16.7	
Approach LOS		C			B			B			B	

Timer - Assigned Phs	1	2		4	5	6	7	8				
Phs Duration (G+Y+Rc), s	11.2	23.8		23.1	9.6	25.5	11.3	11.8				
Change Period (Y+Rc), s	6.0	6.0		6.0	6.0	6.0	6.0	6.0				
Max Green Setting (Gmax), s	14.0	29.0		49.0	14.0	29.0	14.0	29.0				
Max Q Clear Time (g_c+I1), s	4.7	12.5		4.3	3.2	13.9	3.2	5.0				
Green Ext Time (p_c), s	0.2	4.3		0.6	0.1	5.6	0.1	0.5				

Intersection Summary												
HCM 6th Ctrl Delay			17.9									
HCM 6th LOS			B									